

# UC Santa Barbara Earth Science



## Chair's Letter: Susannah Porter

This fall, my older son, born the summer after I arrived at UCSB, left for college. It's been a bittersweet time; we are so excited for his adventures (he's thinking of a geology major—smart kid), but we miss him, and we miss all the younger versions of him (the 14-year old, the 7-year old, the 2-year old...). I think he feels the same

mixture of emotions: euphoric to be in a new place and meeting new people, but sad to leave the people and the places that have shaped him thus far.

Which gets me to the point of this letter. I have heard from several of you that you would love to be more connected to our department and to your old UCSB community. What can we do to help you strengthen your involvement with this place and the people who shaped you? We have already set up a LinkedIn account (<https://lnkd.in/gtYT8zD>) to help you connect with each other, and we host an annual alumni career panel so our current students can learn from you. We also gather alumni news as it comes in (see p. 8). But we want to do more: send us your ideas! Suggestions thus far include an alumni reunion weekend at UCSB and alumni guest spots on our Earth 18 trips, which bring students to geologically interesting and stunningly beautiful locales around California. Would these be of interest? And what else? We can't wait to hear from you, rekindle old friendships, listen to good stories, and strengthen the ties that unite us!



Chris Everett (left) and Claire Divola (right) participating in Earth Science Outreach to high school students. Photo: Alex Simms

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Header photo: Slicklines on a fault surface in the Matilija Formation, Gibraltar Road, Earth 2. Credit: Zach Eilon

# Summer Field 2023 | Ely, Nevada

by Francis Macdonald



Photos: Eiel Anttila

Professors Phil Gans and Francis Macdonald took some fifteen undergrads and two grad students into the Schell Creek Range of northern Nevada for a 6-week field camp. The weather was sparkling, flowers were popping, and the food

was scrumptious despite the camp cook going on walkabout for the first 3 weeks. Students learned to map a variety of rock types in steep terrain using traditional techniques and incorporating new digital and satellite technology. The work will

provide the framework for a new age model for Neoproterozoic metasediments on the distal margin of ancestral North America and reconstructions of Eocene paleotopography prior to Basin and Range extension.

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## Justice, Equity, Diversity and Inclusion (JEDI)

by Zach Eilon and Andy Wyss, JEDI Faculty Committee Chairs

The Department's JEDI committee continues to promote policies that expand the diversity and accessibility of our academic program at all levels. Our student-led GEMSS mentoring group continues to build on its successes. Our 104G course: *Digital Analysis and Interpretation of Field Data* continues to empower undergraduates to major in Earth Science irrespective of physical ability. In light of recent studies that highlight the potential equity barriers associated with field research, three faculty members helped draft a "code of conduct for fieldwork" at a recent UC-wide field-instruction retreat. Applicants to our

graduate program are now evaluated through a holistic process that takes into consideration qualities such as resourcefulness, perseverance, experience, and problem solving as much as it does grades and test results (indeed the GRE is no longer required). In Spring, postdoc Dr. Alex Phillips offered a new reading seminar on *diversity, equity, and inclusion in geoscience higher education*. We also re-wrote departmental bylaws to enact policies for more equitable and supportive faculty hiring. This coming year, look out for a new JEDI lecture series!

# Quaternary Ice Sheets and Sea Levels— A trip to Scotland

by Alex Simms

With the help of the York Mandra Student Support Fund, our group of sixteen graduate and undergraduate students led by Professor Alex Simms traveled to Scotland for 10 days at the end of March as part of a course entitled *Quaternary Ice Sheets and Sea Levels*. Although the focus of the fieldtrip was on the glaciation of Scotland, we couldn't pass up the opportunity to visit some of the classic geology sites of Scotland including Siccar Point (Hutton's Unconformity), the Moine Thrust in Assynt, and some of the beautiful old rocks of the Stoer and Torridonian groups. We started and ended our trip in Edinburgh, but traveled all across northwest Scotland. We were joined by faculty from Stirling University (Prof. Tom Bradwell) near Loch Lomond where we visited the classic Younger Dryas moraines, Durham University (Prof. David Evans) on the Isle

of Skye, and York University (Prof. Ed Garrett) in Northern England, where we saw deposits from the Storegga Slide Tsunami. We had relatively good weather for Scottish standards—we even saw the sun on a couple occasions! Every student had the opportunity to present a poster at one of our stops. They led the discussion and shared what they had learnt about the topic before coming to Scotland. Some other highlights of the trip included cooking at several hostels, discussing Charles Darwin's theories on the formation of the Parallel Roads of Glen Roy, hiking the Cuillins on the Isle of Skye, seeing Inverness, searching for Nessie on Loch Ness, and walking up the Salisbury Crags in Edinburgh. By the end of the trip, all students were proficient at identifying Younger Dryas moraines, raised post-glacial beaches, and roche moutonnées.



Photo: Alex Simms

# Arthur G. Sylvester

## Professor Emeritus of Geological Sciences

by Kathryn Sylvester Bowers



Backpacking in 2010 up near Pine Creek Pass in the John Muir Wilderness. Photo: Peter Morris

My father died in May, aged 85, and since then I've been reflecting on how much the UCSB Earth Sciences community shaped and sustained him. Art Sylvester was many things—father, grandfather, friend, advocate, organizer—but he was to his very core a UCSB professor and proud member of its community for more than 50 years. In his final days, the outpouring of well wishes from UCSB faculty, staff, students, and alumni bolstered and pleased him. And that gave strength to my family and me.

Regarded as a broad geologic thinker, Art researched structural, seismic, and igneous rock formations in the western United States and around the world. As a Fulbright Scholar at the University of Oslo,

he studied the evolution of granitic plutons, and he later directed the UC Scandinavian Study Center at the University of Bergen.

My father was a keen editor, applying his infamous purple ink to students' papers and professional publications alike. He oversaw the Geological Society of America's journal, *The Bulletin*, for five years. He was a wonderful translator of complex scientific ideas, relishing opportunities to explain his knowledge using whatever props were on hand (from pencils and bandanas to saltshakers and dinner plates). He was a perhaps too-enthusiastic bookseller—my apologies if you were on the receiving end of one of his hard-sell

pitches for my books. But, like father, like daughter, I can wholeheartedly recommend his: *Roadside Geology of Southern California*, *Geology Underfoot in Southern California*, and *Geology Underfoot in Death Valley and Eastern California*.

Last spring, just days after he died, Art was posthumously awarded a GSA Career Contribution Award at the Cordilleran Section meeting in Reno. Sadly, but also joyfully, the sessions became an impromptu memorial, as conference-goers shared memories of Art. A lot of the stories were about Art's adventures in the field. Because—however much he liked research, editing, and writing—Art loved teaching, and mentored literally thousands of students to become scientists and science communicators.

I recently stopped by Art's office for the sober task of dismantling his professional quarters. A string of Norwegian flags fluttered on the corkboard next to his door. The long hallway was quiet. But I could well imagine the clamor and excitement of thousands of conversations with colleagues, students, and friends that took place on that spot over decades. A workplace, of course, is not a family. But work and family do intertwine. In memory of my dad's life, and on behalf of his whole family, I'd like to thank you, the UCSB Earth Sciences community, for inspiring his work and recognizing his legacy.

# Field Work on Chirikof Island Alaska reveals major earthquake history

by Kristin Morell and Suoya Fan



Professor Kristin Morell in the field on Limuw (Santa Cruz Island), CA, showing slickenlines on fault surface in background. Photo: Zach Eilon

The Alaska subduction zone hosts some of the most powerful and devastating interconnected geohazards, including volcanic eruptions, earthquakes, tsunamis, and large landslides. In 1964, a magnitude 9.2 earthquake which ruptured the subduction megathrust was so massive that it triggered additional earthquakes in the upper plate, causing several tsunamis and hundreds of landslides.

This past summer, Prof. Kristin Morell, Postdoc Suoya Fan, and Researcher Peter Hauessler of the USGS undertook a two-week paleoseismic field study to explore a major fault in the upper plate of the Alaska subduction zone located on Chirikof Island. This small (20 km-long) deserted island is unique for Alaska in that it is devoid of bears. However, the island is home to a herd of 500

feral cattle that have occupied the island as their own since their owners abandoned them in the early part of the last century.

Because the island is so remote, our mission was the first to examine this fault since it was first described in the late 1960s. The group was interested in this fault because of reported evidence of ground surface rupture in 1890, which may have caused tsunamis in the past.

Our research on Chirikof Island seeks to understand whether ruptures on these types of faults occur on their own, or whether they are part of a hazard cascade and are associated with other large earthquakes such as the 1964 earthquake.

In addition to adding a new fault to the map of active faults in the USA, the work aims to elucidate the timing and magnitude of the most recent earthquakes on this fault. This work will ultimately aid in our understanding of what causes earthquakes and tsunamis in Alaska, such as the one that struck Alaska in 1964.



Dr. Suoya Fan, collecting a luminescence sample from loess on Chirikof Island, Alaska. Photo: Kristin Morell

## STAFF SPOTLIGHT: CHRISTOPHER CROW



Hello my name Christopher Crow. I was born and raised in Goleta/ Santa Barbara and spent a lot of time at UCSB as I had family that worked here growing up and later on boarded my horse at West Campus Stables. I have had jobs in construction, roofing and building maintenance as well as a ranch hand and later a barn/ property manager. I then went on to work for an auto & farm equipment mechanic and for the last 19 years at an aerospace machine shop where I did machine maintenance, building repairs and outside processing. I believe everything I have done in my life thus far was leading me to this position. I can't wait for the opportunities to help serve the Department of Earth Science.

## Undergraduate Spotlight



### Gwen Conway and Billyjack Jory

Gwen Conway and Billyjack Jory completed a senior thesis with Professor Matt Rioux. They studied the Point Sal ophiolite, a piece of oceanic crust exposed along the coast

near Lompoc, CA. Gwen used geochemistry to study the origin of different plutonic rock types within the ophiolite crust, while Billyjack used geochronology to constrain the tectonic setting during formation and uplift of the ophiolite. Their projects have large-scale implications for the formation of oceanic crust and ophiolites.

Photo: Billyjack and Gwen during field work at Point Sal.



### Dean Mantelzak

Dean Mantelzak worked with Professor Susannah Porter, discovering new, exceptionally preserved microfossils from ~750 million year-old rocks in the Grand Canyon that still have remnants of original cells inside.



### Brendan Mills

Brendan Mills worked with Professor Robin Matoza and graduate student Hugo Ortiz on a senior thesis entitled: "Characterizing and localizing the 2018 seismic eruption tremor at Sierra Negra using network covariance".



### Kyla Murphy

Kyla Murphy worked with Professor Dave Valentine to participate in six research expeditions over the past year, including diving in Alvin, the famed submersible.

Photo: Kyla Murphy prepares for her dive on the submersible Alvin.



### Sophia Ortner

Sophia Ortner is working with Professor Roberta Rudnick on the history of the lower crust beneath central Montana. She is dating accessory minerals in lower crustal xenoliths to determine eruption ages for the host alkaline magmas.

## We Wish For

**Distinguished Lecturer Fund**, which supports the invitation of colloquium (aka "speakers club") speakers of excellence to the department.

**Unrestricted funds**, which support revitalization of department space; field equipment that is essential to our field classes; and microscopes that are essential to our lab classes.

### Your Ideas Welcome

We truly welcome your thoughts. What lessons did you take away from your time at UCSB? What would benefit the most from improvements? We solicit your input, and greatly value your perspective.

## Your Donation Dollars at Work



Summerfield 2023 camp set up; Ely, NV. Photo: Todd Penniman

We are deeply grateful to our many alums, colleagues, and friends of the department who have helped us financially this past year!

“ The Walrus and the Carpenter  
Were walking close at hand;  
They wept like anything to see  
Such quantities of sand:  
If this were only cleared away,  
They said, it *would* be grand!”

If seven maids with seven mops  
Swept it for half a year,  
Do you suppose, the Walrus said,  
That they could get it clear?  
I doubt it, said the Carpenter,  
And shed a bitter tear.

”

—The Walrus and the Carpenter by Lewis Carroll, a favorite poem of Ed Keller's, a beloved professor that we lost too soon.

# With Appreciation

The Department of Earth Science profoundly thanks the following individuals and institutions for their generous donations between July 2022 and June 2023

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Although we've endeavored to make our list of donors complete, please excuse any oversights.

## Thank you

Your generosity in funding this award and the students has allowed for me to have an amazing summer field course.

*I am honored to receive this recognition for my work in the field and during my time here at UCSB.*

*I am profoundly appreciative of donors that contribute to the Department and the students.*

*I would like to express my immense gratitude for the generous donation to the department and the students.*

# Dr. Jim Mattison

by Matt Rioux

Jim was a specialist in high-precision U-Pb dating of zircon and made several key discoveries that significantly advanced U-Pb geochronology. Jim did his PhD at UCSB working with Cliff Hopson and George Tilton, one of the founders of U-Pb dating. He then went on to complete a post-doc at the Carnegie Institution of Washington before returning to UCSB. Throughout his career, Jim was frequently ahead of his time in developing new techniques and understanding the complexities of the U-Pb system. As a post-doc at CIW, he developed the first two-bottle still for producing cleaner acids, which decreased Pb in blanks by over an order of magnitude, a key development for reducing sample size and increasing the precision and accuracy of dating. His still design was adopted by labs around the world and used for decades. He also made key theoretical contributions recognizing the potential impact of disequilibrium in the U decay chain to U-Pb dates, outlining the implications of uncertainties in the U decay constants in dating, and pushing for robust error propagation. Each of these topics have become increasingly important as U-Pb dating has become more precise (as a result of Jim's and others' constant improvements). Perhaps Jim's biggest contribution was his development of the chemical abrasion method. A constant concern in U-Pb dating is that loss of Pb can lead to erroneous dates. Jim spent years developing the chemical abrasion method, which uses a combination of annealing of zircon, followed by one or more leach steps to preferentially dissolve damaged zircon prior to final analysis, minimizing the impact of Pb-loss. The chemical abrasion has been adopted by high precision labs around



the world. It significantly improved the precision and accuracy of dating, providing new insight into the timing and rates of a wide range of geological processes. His method is now the "gold standard" for U-Pb dating and his seminal 2005 paper on the technique has been cited over 1,300 times.

Beyond his contributions to U-Pb dating, Jim also did extensive work on Cordilleran geology, ophiolites, and many other topics. He served as Chair of our department twice, first in the 1990s and again in the 2000s. He was also an engaging teacher, often adding interesting asides and stories to his lectures; his skill was recognized by the Muckers teaching award.

As a colleague, Jim was humble, kind, generous, and supportive, and he cared about the well-being of everyone around him. He will be very missed by those that knew him.

## Alumni News

**Odalys Callejas** (BS 2022) is undertaking a PhD in the Earth and Atmospheric Sciences Department at Cornell University.

**Khalil Droubi** (BS 2020) completed his MS degree in the Department of Geoscience at the University of Wisconsin, Madison and is now undertaking a PhD at the same institution.

**Francisco Apen** (PhD 2022) is currently a Presidential Postdoc at Princeton University and has accepted a faculty position at Northern Arizona University.

**Allison Greaney** (PhD 2018) is an Associate R&D Radiochemist at Oak Ridge National Laboratory in Tennessee.



## Claire Divola

I am a 3rd-year PhD student working with Dr. Alex Simms. Before starting at UCSB, I earned my BS in geology from UCLA, where I spent time studying the formation mechanism of chaotic terrain within Galilaei crater, Mars, to decipher the geologic and fluvial history of the region.

At UCSB, my focus centers around sedimentology and its applications in understanding quaternary coastal systems and sea level change. My primary project utilizes foraminifera and the sedimentary record preserved within the marshes of

Tomales Bay, part of the San Andreas Fault Zone, to reconstruct sea levels and earthquake recurrence patterns along the Pacific Coast. Shifting from the Pacific Coast to the Antarctic Peninsula, another aspect of my work uses historically-harvested whale bones to establish the radiocarbon reservoir of this region.

My research has given me the opportunity to spend time in the field, collecting sediment cores and foraminifera samples. In the lab, I conduct grain size analysis, prep samples for radiocarbon dating, and take scanning electron microscope images of my adorable Tomales Bay microfossils. With a few more years



left in my PhD journey, I'm excited to see where my research leads me next!

## Hailie Kittner

As an undergraduate majoring in Biology at UCSB, my academic journey was transformed when I joined Dave Valentine's lab during my first year. Early on, I delved into a small incubation experiment studying bacterial hydrocarbon degraders in the waters near Coal Oil Point. Microbes are the unsung heroes in dissolved hydrocarbon removal in the deep ocean. During my sophomore year, I joined the lab on a research cruise aboard the Research Vessel Atlantis, a pivotal experience that solidified my passion for marine science.

My senior thesis centered on a large-scale incubation experiment investigating hydrocarbon biodegradation in Santa Barbara, expanding my understanding of this critical process. In 2022, I continued this work into my Master's program, replicating my experiment in the Gulf of Mexico during a second R/V Atlantis expedition.

Beyond hydrocarbon research, I've begun working to characterize the sediment microbial community in the polluted San Pedro Basin. Having collected dozens of sediment cores, I aim to explore the impact of pollution on microbial ecosystems and its repercussions for the environment. As I enter my second



year, I eagerly anticipate delving deeper into this fascinating field, armed with a treasure trove of mud and a passion for scientific discovery.

## LinkedIn

Seeking to strengthen and enliven our department network, we encourage you to follow our new "UCSB Department of Earth Science" page on LinkedIn. Former students, please follow instructions on the page that will identify you as a department alum. <https://lnkd.in/gt3VTrk>

# DISTINGUISHED ALUMNI 2023

*Annually, the Department honors two of its alumni—one from academia, and one from elsewhere—celebrating their accomplishments and providing our current students exemplary role models.*

## Gretchen Mullendore

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Gretchen earned her B.S. in Geophysics from UCSB in 1998. She first visited UCSB as a summer intern working with Ralph Archuleta on analysis of the seismic waves recorded during the 1994 Northridge earthquake (Gretchen lived near Pasadena at the time of the '94 quake).

Gretchen continued her research career at University of Washington, earning her PhD in Atmospheric Sciences in 2003. After a postdoctoral research position at UCLA, she became an assistant professor in the Atmospheric Sciences Department at University of North Dakota (UND) in 2007.

She eventually earned her full professorship at UND and served as both Graduate Director and Chair. She conducted research for multiple sponsors, on topics ranging from chemical transport in severe storms to numerical weather prediction.

In 2021, Gretchen started as Director of the Mesoscale and Microscale Meteorology (MMM) Laboratory at the National Center for Atmospheric Research. In this role, she is responsible for advancing MMM's mission to advance the understanding of weather and climate, to apply this knowledge to benefit society, and to promote equity and inclusion in the sciences. A significant portion



of MMM's work with the community involves supporting a suite of community weather models used all around the globe.

## Javier Santillán

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Javier grew up in the east of the San Francisco Bay Area and majored in Geological Sciences at UCSB with the hope of studying mountain ranges. After a challenging Summer Field in 1998, he shifted his focus to lab-based analytical techniques. He learned the basics of X-ray diffraction as an undergraduate and moved on to UC Santa Cruz to study Mineral Physics under Quentin Williams. He earned his PhD in 2004 with a focus on carbonates. Javier then moved on to MIT as a Ford Foundation Postdoctoral Fellow focused on synchrotron X-ray



diffraction and Raman spectroscopy. He completed his studies in 2006

and started his career in industry at a Massachusetts-based startup, Ahura Scientific (now part of Thermo). At Ahura, Javier focused on training military and civilian hazmat and law enforcement on the use of portable Raman spectroscopy for identification of hazardous chemicals, pharmaceuticals, and illicit drugs. In 2008, Javier joined General Electric in California as a lead applications engineer running an X-ray computed tomography (CT) lab. In 2012 he brought his skill sets in CT and XRD to Apple's Failure Analysis Team. For the past decade he has worked on materials analysis across development of multiple product lines.

# Faculty Awards



## David Valentine

Professor David Valentine was awarded the 2023 UCSB Faculty Research Lecturer. Awarded annually to one faculty member determined to be the most distinguished in research or other creative achievement. The award is considered to be the highest honor the UCSB faculty can bestow on one of its members.



## Robin Matoza

At the 28th International Union of Geodesy and Geographics (IUGG)'s general assembly in Berlin, Germany, Professor Robin Matoza Presented the union lecture of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).



## Toshiro Tanimoto

Professor Toshiro Tanimoto received a fellowship from the John Simon Guggenheim Memorial Foundation.



## Roberta Rudnick

Professor Roberta Rudnick was awarded the Goldschmidt Medal from the Geochemical Society, the highest award in geochemistry. Professor Rudnick was also given the honor of being the Plenary Speaker at the Australian Earth Sciences Convention.



## Susannah Porter and John Cottle

Professor and department Vice Chair Susannah Porter and Professor John Cottle were elected Fellows of the Geological Society of America at the spring GSA Council meeting. This honor is bestowed on the best of their profession.



## STAFF SPOTLIGHT: SEAN MCCLURG



As a recent transplant from the East Coast, I earned my AA in General Studies from Suffolk Community College. I embarked on my IT journey by securing my Microsoft Certified Systems Engineer certification and focused my career path in the legal sector working for many years in the prestigious law firms of DLA Piper and Mayer Brown. After some time working in IT supporting local government, I switched to UCSB where I am excited to work with the dynamic team in Earth Science. In my spare time, I enjoy hiking, gardening, and spending time with family and 2 canine kids.



SEM Image of a foraminiferan from Tomales Bay, California. Photo: Claire Divola

Department of Earth Science  
University of California, Santa Barbara  
1006 Webb Hall  
Santa Barbara, CA 93106-9630



Chirikof Island, Alaska. Photo: Suoya Fan

# EARTH SCIENCE NEWS